



## Parabolic Equations with Measure Data and Three Unbounded Nonlinearities in Weighted Sobolev Spaces

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**Abstract:** In this work, we study the degenerated problem

$$\begin{aligned} \frac{\partial b(x, u)}{\partial t} + \operatorname{div}(a(x, t, u, Du)) + H(x, t, u, Du) &= \mu \quad \text{in } Q, \\ u &= 0 \quad \text{on } \partial\Omega \times (0, T), \\ b(x, u)(t = 0) &= b(x, u_0) \quad \text{on } \Omega, \end{aligned} \tag{1}$$

in the framework of weighted Sobolev space. The main contribution of our work is to prove the existence of a renormalized solution without the sign condition and the coercivity condition on  $H(x, t, u, Du)$ . The critical growth condition on  $H$  is with respect to  $Du$  and no growth with respect to  $u$ . The datum  $\mu$  is assumed in  $L^1(Q) + L^{p'}(0, T; W^{-1, p'}(\Omega, w^*))$  and  $b(x, u_0) \in L^1(\Omega)$ .

**Keywords:** *nonlinear parabolic equation; weighted Sobolev spaces; renormalized solutions.*

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